UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,865,028 B2
DATED : March 8, 2005
INVENTOR(S) : Christophe Moustier et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 7,
Line 50, the formula should read: -- d(ai') = Ki αI --;

Column 10,
Line 5, a new paragraph should start after "ID2";
Line 25, there should be no new paragraph after "Img1";
Line 62, "pair" should read -- part --;

Column 11,
Line 35, "Pd" should read -- Fd --;
Line 58, the second instance of "Imax" should read -- Jmax --;

Column 14,
Line 59, "LA" should read -- L4 --;

Column 17,
Line 26, "dcrmax" should read -- drmax --;

Column 18,
Line 15, "αl, α2, α3, α=η°" should read -- α1, α2, α3, α=90° --;

Column 21,
Line 22, please delete the claims in their entirety and replace with the following:

1. A method for capturing a digital panoramic image comprising:

projecting a panorama onto an image sensor by means of a fish-eye objective lens having a constant field angle relative to its optical axis, the image sensor being rectangular in shape,

the fish-eye objective lens being provided to project onto the image sensor, without reducing the field of view, a distorted panoramic image which is not in the shape of a disk and which covers a number of pixels on the image sensor higher than the number of pixels that would be covered by a conventional image disk.

2. The method according to claim 1, wherein the fish-eye objective lens has an image point distribution function that varies according to axes perpendicular to the optical axis of the objective lens, and which has a minimum spreading rate of the image along a first axis perpendicular to the optical axis and a maximum spreading rate of the image along at least a second axis perpendicular to the optical axis, such that the image projected onto the image sensor is expanded along the second axis.

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Column 21 (cont'd),

3. The method according to claim 2, wherein the first and the second axes of the objective lens are perpendicular and the image projected by the objective lens onto the image sensor is ellipsoidal in shape.

4. The method according to claim 3, wherein the image sensor is arranged relative to the first and second axes of the objective lens so that the major axis of the ellipsoidal image coincides with an effective length of the image sensor.

5. The method according to claim 3, wherein the image sensor is arranged relative to the first and second axes of the objective lens so that the major axis of the ellipsoidal image coincides with a diagonal of the image sensor.

6. The method according to claim 2, wherein the objective lens has a distribution function that is not linear and that has a maximum divergence of at least ±10% compared to a linear distribution function, such that the projected image has at least one substantially expanded zone and at least one substantially compressed zone.

7. The method according to claim 1, wherein the fish-eye objective lens comprises a combination of a group of lenses provided to capture a panoramic image according to a determined field angle and at least one cylindrical lens having an axis of revolution perpendicular to the optical axis of the objective lens.

8. A method for displaying on a screen an initial panoramic image captured in accordance with the method according to claim 1, the method comprising:

correcting the distortions of the initial image.

9. The Method according to claim 8, wherein the correction step comprises transforming the initial image into a corrected digital image in the shape of a disk, the diameter of the corrected image being chosen so that the corrected image comprises a number of image points higher than the number of pixels of the image sensor covered by the initial image.

10. The method according to claim 9, wherein the initial image is ellipsoidal in shape and the corrected image has a diameter the size in number of pixels of which is at least equal to the size in number of pixels of the major axis of the initial ellipsoidal image.

11. The method according to claim 8, further comprising:

projecting, onto the initial image, image points of an image sector to be presented on the screen,

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Column 21 (cont'd),

allowing the colors of the image points of the image sector to be presented on the screen to be determined,

wherein the step of projecting the image points of the image sector onto the initial image is performed by means of a distribution function representative of the optical properties of the fish-eye objective lens, such that the step of correcting the distortions of the initial image is implicit in the projection step.

12. The method according to claim 11, wherein the projection step comprises a first step of projecting the image points of the image sector onto a sphere portion and a second step of projecting, onto the initial image, the image points projected onto the sphere portion.

13. A computer program product recorded on a medium and loadable into the memory of a digital computer, the computer program containing code executable by the computer that is arranged to execute the steps of the display method according to claim 8.

14. A fish-eye objective lens having a constant field angle relative to its optical axis and comprising optical means for projecting the image of a panorama onto an image sensor, the fish-eye objective lens comprises optical means for projecting, without reducing the field of view, a distorted image that is not in the shape of a disk and which covers a number of pixels on an image sensor higher than the number of pixels that would be covered by a conventional image disk.

15. The fish-eye objective lens according to claim 14, having an image point distribution function that varies according to axes perpendicular to the optical axis of the objective lens, and which has a minimum spreading rate of the image along a first axis perpendicular to the optical axis and a maximum spreading rate of the image along at least a second axis perpendicular to the optical axis, such that an image delivered by the objective lens is expanded along the second axis.

16. The fish-eye objective lens according to claim 15, having a distribution function that is not linear and that has a maximum divergence of at least ±10% compared to a linear distribution function, such that an image delivered by the objective lens has at least one substantially expanded zone and at least one substantially compressed zone.

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17. The fish-eye objective lens according to claim 14, comprising a combination of a group of lenses provided to capture a panoramic image according to a determined field angle and at least one cylindrical lens having an axis of revolution perpendicular to the optical axis of the objective lens.

18. The fish-eye objective lens according to claim 14, comprising optical means forming an apodizer.

19. The fish-eye objective lens according to claim 18, wherein the optical means forming an apodizer comprise at least one aspherical lens.

20. The fish-eye objective lens according to claim 14, comprising at least one distorting mirror.

21. The fish-eye objective lens according to claim 14, wherein the lens is a panoramic adapter lens and is provided to be placed in front of a still camera non-panoramic objective lens.

Signed and Sealed this

Twenty-third Day of August, 2005

JON W. DUDAS
Director of the United States Patent and Trademark Office